CSE 561
Computer communication and networks

Winter 2021

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Welcome!

About me

Things you cannot do if the network goes down

Attend this lecture!

Pay bills

Watch movies

Book flights

Call 911

Socially network

Order food

….

We’ll learn

Design principles

Fundamental techniques

New things coming down the pipe

Why didn’t COVID-19 break the internet?

The short answer to why the internet has survived a huge surge in traffic during the global coronavirus pandemic is that the infrastructure that makes up its backbone was designed to survive just such an emergency.

https://www.networkworld.com/article/3541357/why-didnt-covid-19-break-the-internet.html

Course organization

1. Read papers
   - Deeply read: 1-2 per class
   - Shallow reads: 1-2 per class

Check out: https://derekchia.com/how-to-read-a-research-paper-3-pass-approach/
   - Deep read = All three passes
   - Shallow read = 1st pass

Discuss on Ed
   - Before noon on class day
   - Post a question, answer someone's question, write a short review

Course organization

2. Research project
   - Groups of 2-3
   - Topic of your interest

Intermediate milestones

- Jan 20 – pre-proposal (1 page)
- Feb 1 – proposal (1 page + milestones)
- Feb 17 – Milestone 1 (writeup + gitlab)
- Mar 3 – Milestone 2 (writeup + gitlab)
- Mar 18 – Final (writeup + gitlab + talk)

Course organization

3. Lectures

    - Many from world-experts

Course organization

4. Two Quizzes
    - “Take home” – Complete within 24 hours

Feb 3, Mar 10

Course organization

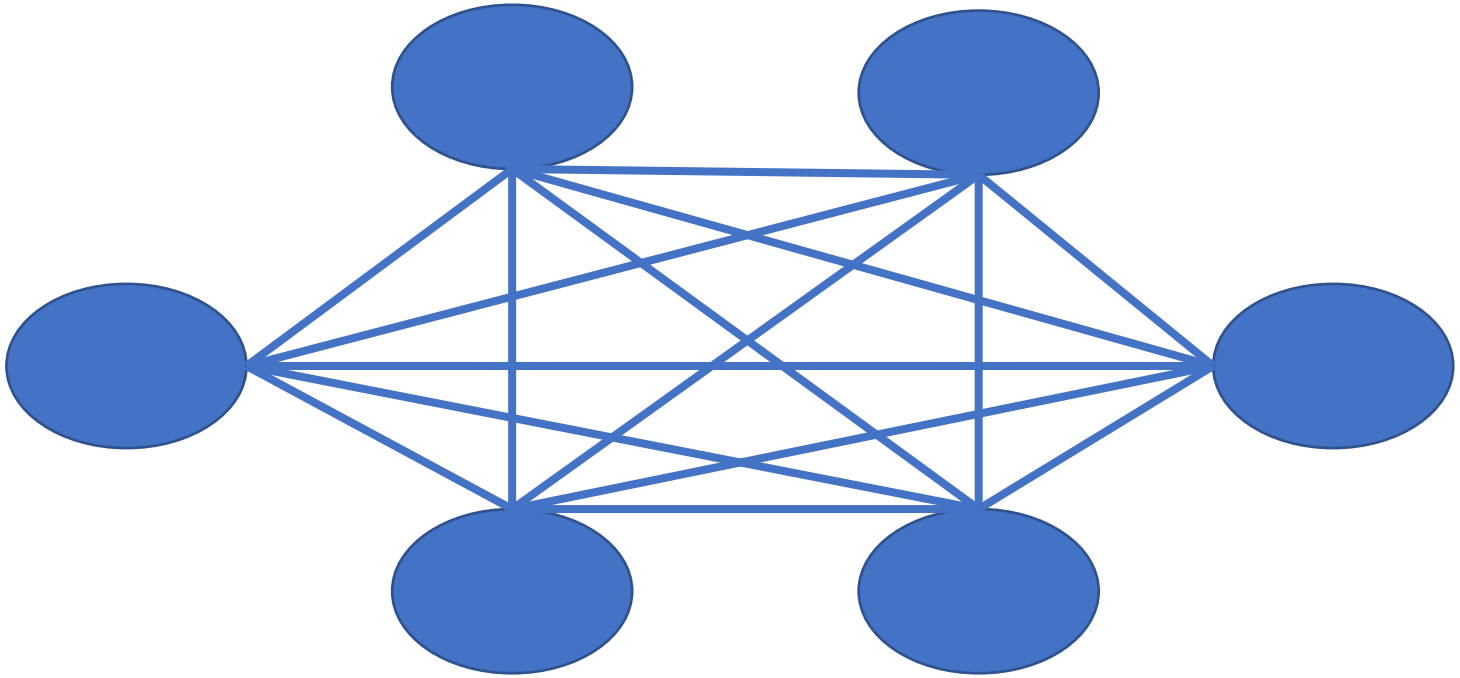
Grade distribution

- Project: 55%
- Quizzes: 20%
- Online discussion: 20%
- In-class participation: 5%

Building a network

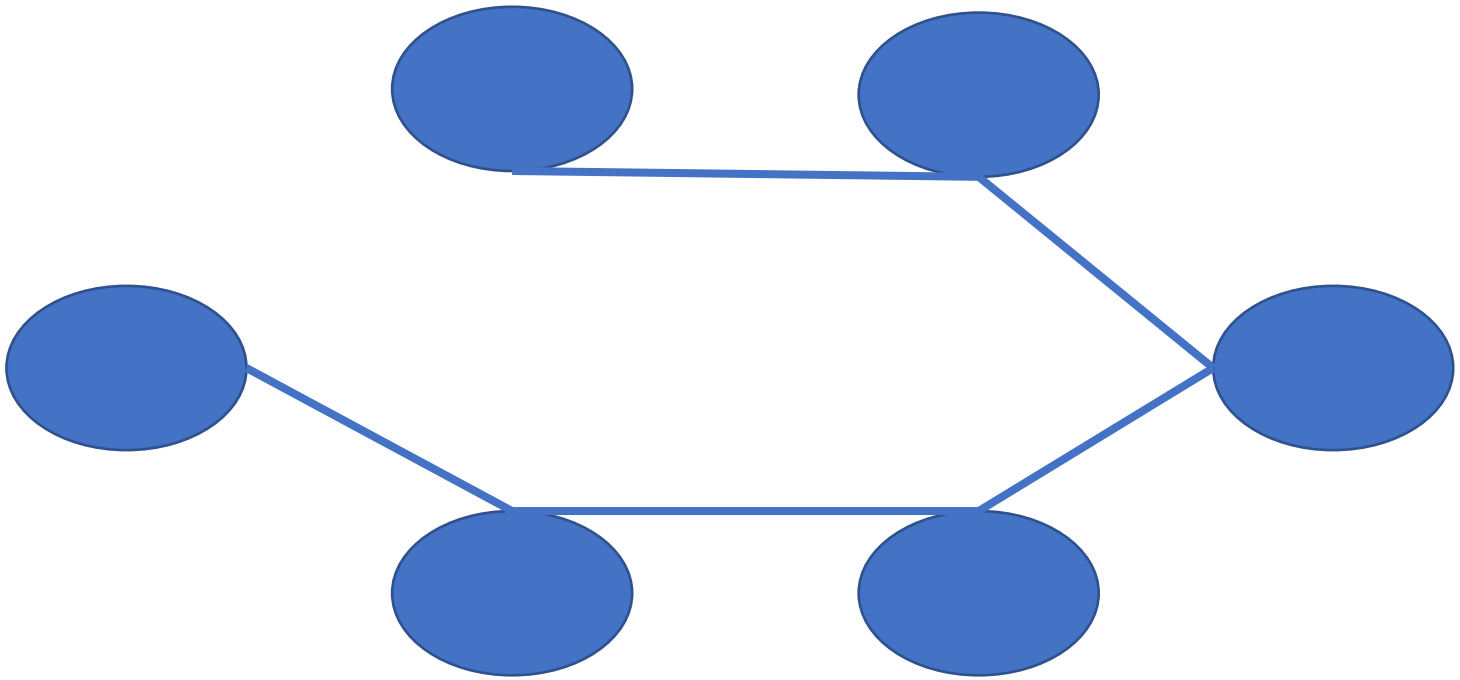
Challenge: How to communicate digital information over the link? (not this course)

Building a bigger network



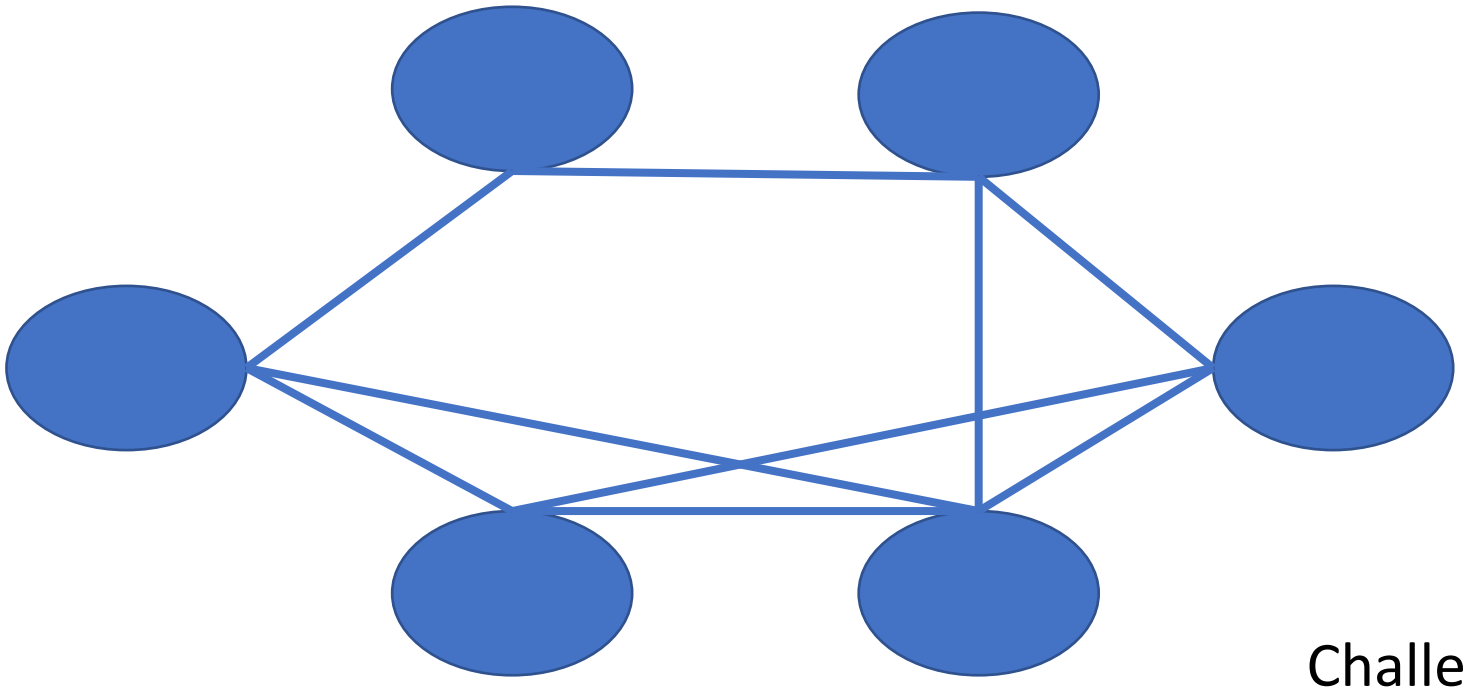
Challenge: How to connect nodes together?

Building a bigger network



Challenge: How to connect nodes together?

Make the network work



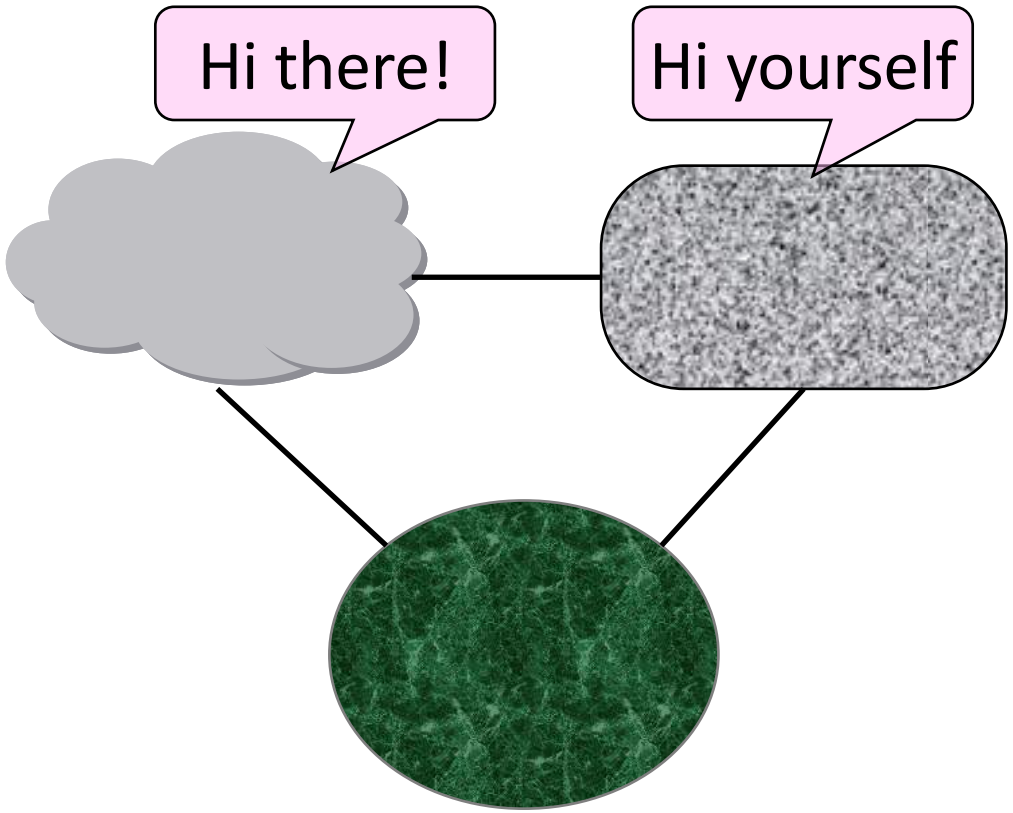
Challenges

1. How to address nodes?
2. How to find info of interest?
3. How to find a path to that location?
4. How to use resources efficiently and fairly?
5. How to debug problems?

Challenges are not addressed in isolation

- Hardware capabilities
- Application requirements

Making many networks work: Internetworking



How networks may differ

- Service model (datagrams, VCs)
- Addressing (what kind)
- QOS (priorities, no priorities)
- Packet sizes
- Security (whether encrypted)
- …

Internet is one type of internetwork

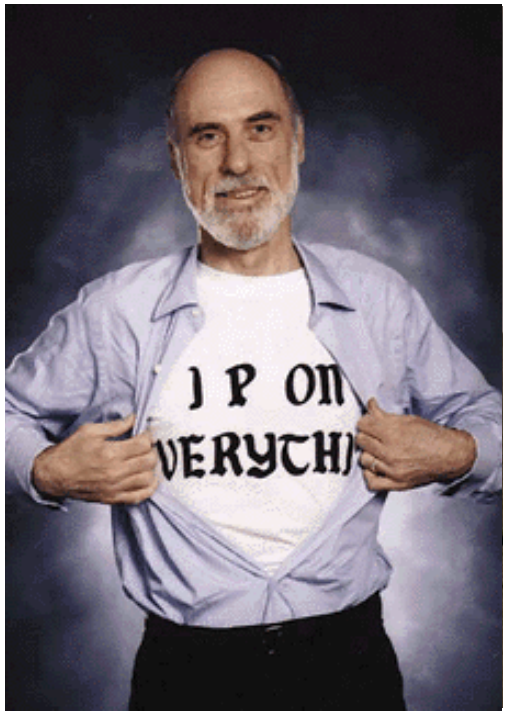
Pioneers: Cerf and Kahn

- "Fathers of the Internet"
- In 1974, later led to TCP/IP

Tackled the problems of interconnecting networks

- Instead of mandating a single technology

Vint Cerf

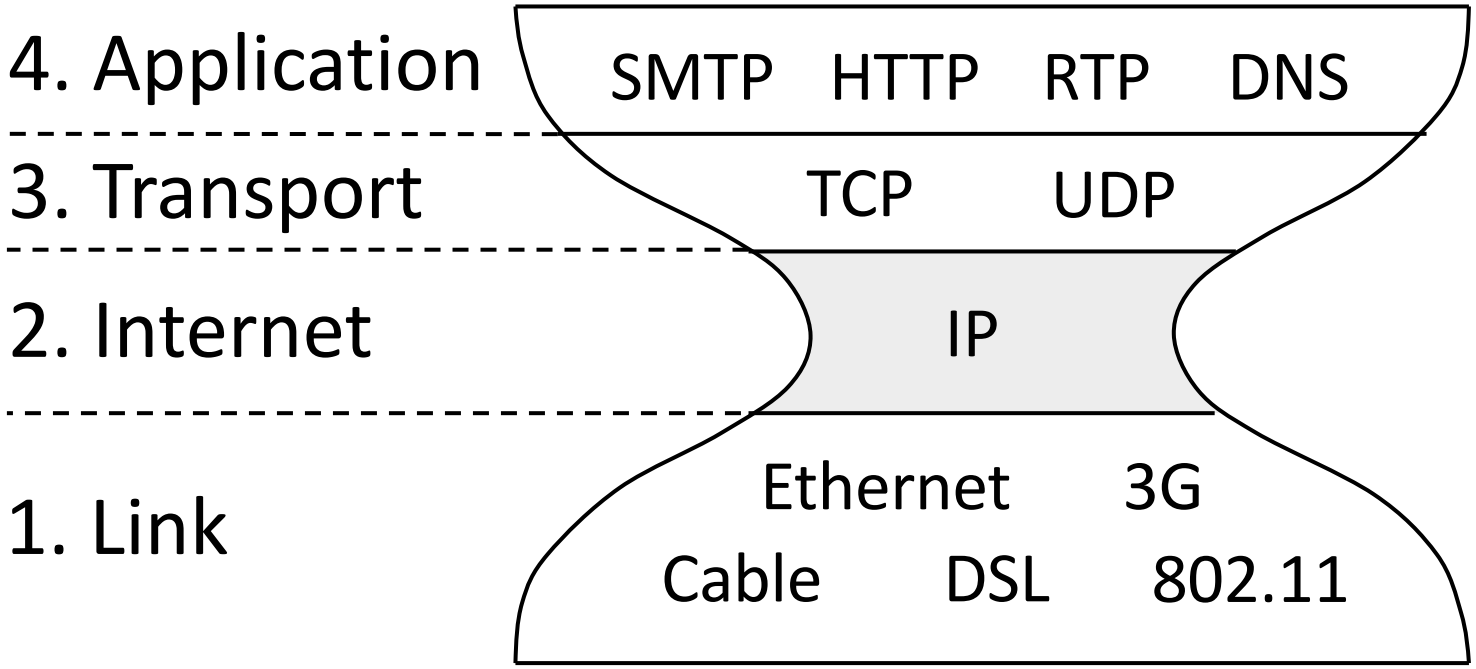


Bob Kahn

IP as a Lowest Common Denominator

- Suppose only some networks support QOS or security etc.
  - Difficult for internetwork to support
- Pushes IP to be a “lowest common denominator”
  - Asks little of lower-layer networks
  - Gives little as a higher layer service

IP as the glue (“narrow waist”)



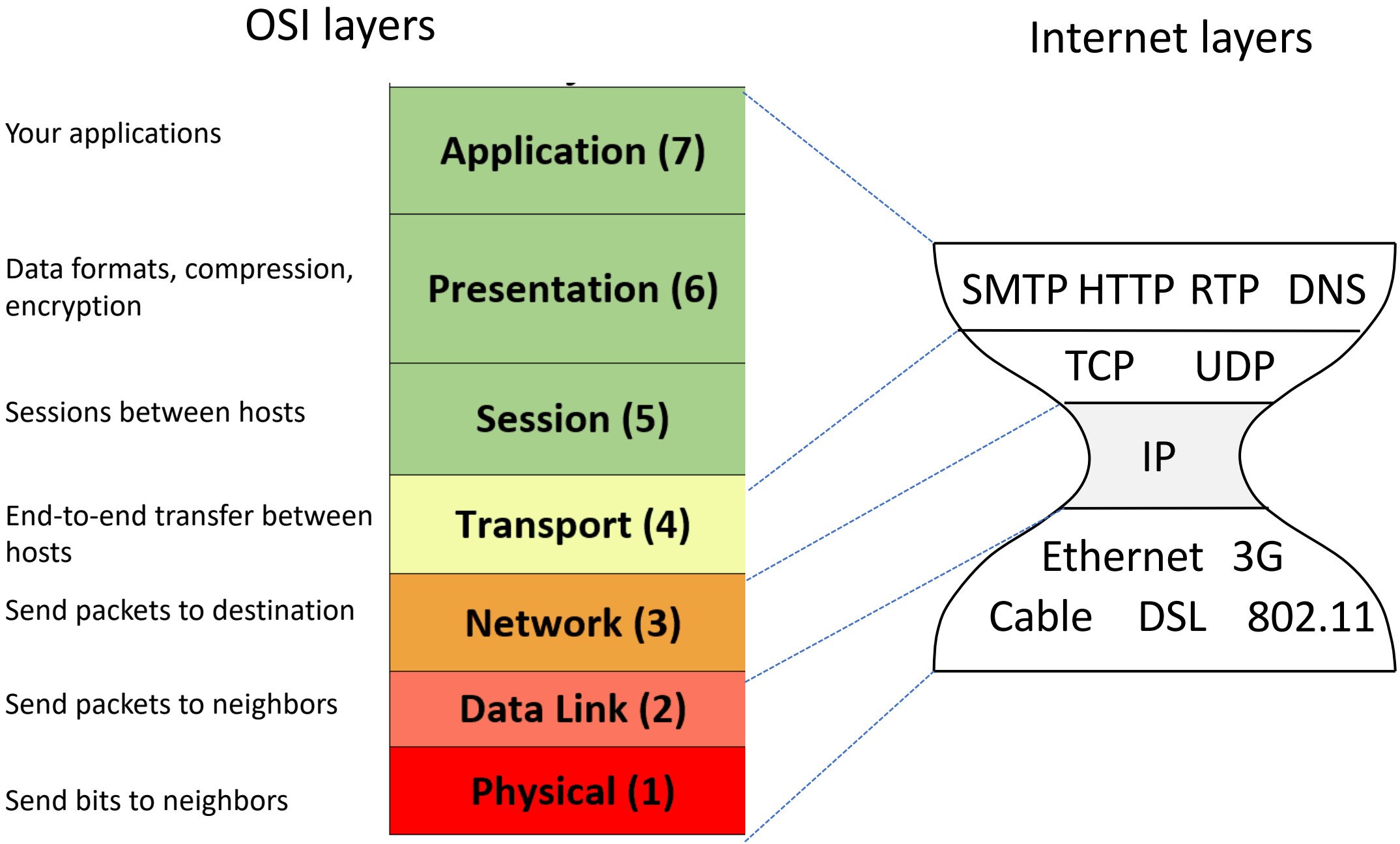
Layering

Divide overall functionality into layers, organized vertically

- Higher layers use the services of lower layers

Solve challenges piecemeal manner

- Same high-level challenge may be solved in different layers
- E.g., reliable transfers, congestion


OSI layers
Internet layers
Your applications
Application (7)
Data formats, compression, encryption
Presentation (6)
Sessions between hosts
Session (5)
End-to-end transfer between hosts
Transport (4)
Send packets to destination
Network (3)
Send packets to neighbors
Data Link (2)
Send bits to neighbors
Physical (1)
SMTP HTTP RTP DNS
TCP UDP
IP
Ethernet 3G
Cable DSL 802.11

Weeks ahead

https://courses.cs.washington.edu/courses/cse561/21wi/#schedule